Earth Science Data & Information System (ESDIS) Project Level 2 Requirements
EOSDIS Version 0

Volume 5

Revision A

December 1996

National Aeronautics and
Space Administration

Goddard Space Flight Center
Greenbelt, Maryland

Earth Science Data & Information System (ESDIS) Project Level 2 Requirements Volume 5 EOSDIS Version 0

Prepared By:

_____
Mark Simons   Date
ESDIS Project Requirements Manager, Acting
GSFC - Code 505

Reviewed By:

_____
Greg Hunolt   Date
DAAC Systems/Science Operations Manager
GSFC - Code 505

Approved By:

_____
Arthur F. Obenschain   Date
ESDIS Project Manager
GSFC - Code 423

Goddard Space Flight Center
Greenbelt, Maryland

Change Information Page

ISSUE	DATE	PAGES AFFECTED	DESCRIPTION
Original	01/25/93	All	N/A
CH01	09/13/93	3-4	CCR 505-01-33-001
Revision A	01/10/97	All	CCR 505-01-33-002

This page intentionally left blank.

List of Affected Pages

Page No.	Revision	Page No.	Revision	Page No.	Revision	Page No.	Revision
Title	Revision A	2-1	Revision A	3-8	Revision A	C-3	Revision A
i	Revision A	2-2	Revision A	3-9	Revision A	C-4	Revision A
ii	Revision A	2-3	Revision A	3-10	Revision A	C-5	Revision A
iii	Revision A	2-4	Revision A	3-11	Revision A	C-6	Revision A
iv	Revision A	2-5	Revision A	3-12	Revision A	D-1	Revision A
v	Revision A	2-6	Revision A	A-1	Revision A	D-2	Revision A
vi	Revision A	3-1	Revision A	A-2	Revision A		
1-1	Revision A	3-2	Revision A	B-1	Revision A		
1-2	Revision A	3-3	Revision A	B-2	Revision A		
1-3	Revision A	3-4	Revision A	B-3	Revision A		
1-4	Revision A	3-5	Revision A	B-4	Revision A		
1-5	Revision A	3-6	Revision A	C-1	Revision A		
1-6	Revision A	3-7	Revision A	C-2	Revision A		

Contents

Appendices

Figures

References

The following documentation forms a part of this document to the extent specified herein.

[1]   Version 0 EOSDIS Implementation Plan, ESDIS, NASA GSFC, November 9, 1990.

[2]   The EOSDIS Project Level 3 Requirements Document, Review Copy #3,
        August 10, 1990.

[3]   Early-EOSDIS Program Plan, NASA Headquarters, Code SEI, Draft - August 1, 1990.

[4]   Version 0 EOSDIS - An Overview, H.K. Ramapriyan and G.R. McConaughy, ESDISP,
        NASA GSFC, January 1991.

[5]   Science Data Plan for the EOS Data and Information System covering EOSDIS Version 0
        and Beyond, May 1992.

[6]   Functional and Performance Requirements Specification for the EOSDIS Core System
        (ECS F&PR), July 1991.

[7]   EOSDIS Version 0 Architecture and Operations Concept (AOC), Draft, December 1991.

[8]   EOSDIS Version 0 Information Management System User Interface Style Guide, (TBD).

[9]   EOSDIS Version 0 Data Policy, (TBD).

[10]   EOSDIS Version 0 Data Formats Evaluation and Recommendations, (TBD).

[11]   Project Data Management Plan (PDMP) Guidelines, Draft, November 9, 1992.

[12]   EOSDIS Version 0 Data Dictionary (TBD).

[13]   EOSDIS Version 0 IMS Developers Lexicon, Draft, 1 October 1992.

[14]   EOSDIS Version 0 User and Data Services Handbook, September 1992.

[15]   Network Working Group Request for Comments (RFC) 1122 - Requirements for Internet
        Hosts -- Communications Layers, Internet Engineering Task Force, October 1989.

[16]   RFC 1123 - Requirements for Internet Hosts -- Application and Support, Internet
        Engineering Task Force, October 1989.

[17]   RFC 1340 - Assigned Numbers, Internet Engineering Task Force, July 1992.

This page intentionally left blank.

Section 1. Introduction

1.1 Scope

This document is the sixth of seven volumes. It describes the overall system requirements for EOSDIS Version 0 (V0) system elements. These requirements have been developed by analyzing the V0 Implementation Plan (Ref 1), the EOSDIS Level 3 Requirements (Ref 2), the Early-EOSDIS Program Plan (Ref 3), and the V0 success criteria contained in the white paper entitled "Version 0 EOSDIS - An Overview" (Ref 4). This set of baseline requirements will be used for designing, implementing, verifying and operating the V0 system. This document does not cover science data priorities being addressed during V0. That information can be found in the companion to this document, the Science Data Plan (Ref 5). The concepts and terminology used in conjunction with V0 are consistent with the Functional and Performance Requirements Specification for the EOSDIS Core System (ECS F&PR) (Ref 6). The Glossary of the ECS F&PR is referenced for this document. This volume, in conjunction with Volume 0, provides the complete set of Level 2 requirements for the Version 0 system.

1.2 Background

The Earth Observing System (EOS) is a long-term interdisciplinary and multidisciplinary research mission that studies global-scale processes that shape and influence the Earth as a "system". The EOS Data Information System (EOSDIS) is a single system that provides the Earth science-related research community with easy and reliable access to the full suite of EOS, data generated by NASA instruments on both U.S. and international platforms. In addition, non-EOS data will be included.

The development and implementation of EOSDIS will be evolutionary in nature, with extensive involvement of the scientific users during all phases. EOSDIS will be built in a series of versions to facilitate evolutionary change by incorporating existing technologies, scientific expertise, operational experience, facilities, and supporting infrastructure that are required to achieve its objectives.

The first step in the evolutionary process will be EOSDIS Version 0 (V0) which will be a "working prototype" with operating elements. In general, a prototype is defined as a preliminary model on which subsequent operational versions are patterned. V0, as a prototype, will not have all the functional capabilities, fault tolerance or reliability provisions of the EOSDIS Version 1 (V1). However, V0 will be made available to be used and evaluated by the users in order to determine the required functional capabilities of the full EOSDIS. In addition, some operational elements will be incorporated and maintained in order to provide non-interrupted services to the science community.

Development of V0 began in FY 91, evaluation and operational use is expected in mid FY 94, and replacement during FY 97. V0 will provide realistic testing for the EOSDIS concepts by supporting the research of scientific users with currently available data. The evolutionary development approach will facilitate a graceful transition, from existing Earth science-related data

and information systems at the Distributed Active Archive Centers (DAACs), to full EOSDIS configuration.

In addition, a parallel effort to produce new data has begun. This effort is called the Pathfinder data set development. The Pathfinder effort, currently managed by NASA Headquarters, will improve access to particular data sets, and produce new products developed by community consensus algorithms. The Pathfinder data sets will be archived and managed by the DAACs.

This document was initially prepared by the Earth Science Data and Information Systems Project (ESDISP) System Manager, and reviewed by the EOS Science Advisory Panel, DAAC Managers, and the EOSDIS System Engineering Review Team (SERT). The SERT recommended that the document be baselined in December 1991, but remain unsigned pending completion of the Science Data Plan (Ref 5). During late 1992, the SERT performed another detailed review of the document, and forwarded it to the ESDISP management for signature.

1.3 System Overview

The V0 EOSDIS has been established by the ESDISP as a first step towards full implementation of EOSDIS. The primary focus of the V0 EOSDIS is to establish working prototypes of EOSDIS information retrieval, science data processing, archiving, product generation, distribution, and networking functionalities. The V0 will not only prepare the DAACs for meeting the objectives of Early-EOSDIS, but also provide an experience base for the design and implementation of the EOSDIS Core System (ECS). This experience base includes working within the EOSDIS system concept to prototype and evolve implementation approaches, data format and communications standards, science data processing library, user support activities and descriptive metadata. The V0 EOSDIS will consolidate present applicable capabilities, build new capabilities where needed, develop most urgently needed experience with data services at the DAACs, and build working relationships among DAACs that will be critical when EOSDIS becomes fully operational.

The ESDISP is responsible for managing and implementing V0. Specifically, the V0 will perform functions required to:

1. Enhance scientific productivity through improved access to current data and the production and use of new data sets derived from currently available and newly acquired data. This will include some support for the EOS Program Office-funded development of "pathfinder data sets" which are existing global, moderate volume, long-term data sets that need to be processed into "community consensus" data products.

2. Evolve and establish interoperability among current capabilities (e.g., Pilot Land Data System, NASA Climate Data System, Alaska SAR facility, WetNet, Global Land Information System, etc.) to establish a working, integrated Earth science data system as a step towards full implementation of EOSDIS. The result of this should be a more unified "Earth sciences" view for the users. However, in doing this, it is essential to provide at least the present level of service, with no interruption or degradation, to the users of the respective data systems at the DAACs.

3. Take near-term actions to improve the infrastructure for collaborative, distributed research, including incorporating a Global Change Master Directory and developing an interoperable catalog system; adopting initial standards, protocols, and guidelines; and expanding the exchange of data within the Earth science community.

4. Build an enhanced experience base that will directly influence the progressive implementation of EOSDIS by the ECS contractor. Such experience with the multiple data systems' users will help evolve user sensitive requirements.

The eight DAACs are distributed throughout the country. Each DAAC includes a Product Generation System (PGS), a Data Archive and Distribution System (DADS), and elements of the Information Management System (IMS). The V0 development includes both efforts unique to the DAACs and integrating "system level" tasks performed cooperatively among the DAACs and the ESDISP. Within V0, priority is given to developing IMS and DADS functionality, while PGS and Networking capabilities will be more limited.

1.4 Requirements Hierarchy

This section identifies the requirements hierarchy and document traceability that apply to the EOSDIS.

1.4.1 EOS Program Requirements

a. EOS Project and Program Requirements, TBD

b. EOS Mission Requirements Request (MRR), TBD

1.4.2 ESDIS Project Level 2 Requirements (Volumes 0 - 6)

a. ESDIS Project Level 2 Requirements, Volume 0: Overall ESDIS Project Requirements

b. ESDIS Project Level 2 Requirements, Volume 1: EOSDIS Core System (ECS)

c. ESDIS Project Level 2 Requirements, Volume 2: EOSDIS Data and Operations System Requirements

d. ESDIS Project Level 2 Requirements, Volume 3: Other ESDIS Project Requirements

e. ESDIS Project Level 2 Requirements, Volume 4: Code O Institutional Support Services

f. ESDIS Project Level 2 Requirements, Volume 5: EOSDIS Version 0 (This volume)

g. ESDIS Project Level 2 Requirements, Volume 6. EOSDIS Backbone Network (EBnet) Requirements

1.4.3 Referenced Requirements Specifications

a. Functional and Performance Requirements Specification for the EOSDIS Core System, July 1991.

    b.   Earth Observing System (EOS) Data and Operations System (EDOS) Functional and Performance Specification, May 1992.

    c.   Earth Observing System (EOS) Communications (Ecom) Functional and Performance Specification, April 1992.

    d.   EOS Test System (ETS) Functional and Performance Requirements Specification, Level 1, Draft, July 1992.

Figure 1-1 provides a graphic representation of the relationship of the ESDIS Project Level 2 requirements to other higher and lower level requirements. Figure 1-2 shows the expansion of the Level 2 requirements into its various volumes, and shows the relationship of this document to the remainder of the volumes of the Level 2 requirements document.

1.5 Organization of Document

The remainder of this document establishes the requirements for V0. The V0 requirements are organized in two major categories: Project / System Level, and DAAC requirements. They are presented in Sections 2 and 3, respectively.

Each requirement has been assigned a number. The first character identifies the major category; "S" for V0 System Level or "D" for DAAC. The second character is used for subdivisions within the major category. The "S" category is divided into subdivisions covering Overall, SPL, Data Formats, Networking, and IMS requirements. The "D" category is divided into subdivisions covering IMS, DADS, and PGS requirements. These first two characters are then followed by a dash and three digits, which represent a unique requirement number within the category.

Appendix A provides identification of the V0 acronyms that are used in the body of this document. The terminology used in this document is consistent with that used in other EOSDIS documentation. Please refer to the Glossary appended to the ECS F&PR (Ref 6).

Appendix B contains general guidelines for generating portable software.

Appendix C provides general guidelines for levels of service and distribution of data sets. Please refer to the Science Data Plan (Ref 5) for more information regarding the level of service appropriate for each data set.

Appendix D provides a cross-reference list between the V0 requirement numbers used throughout this document and the RQID numbers used in the E-TRACER system.
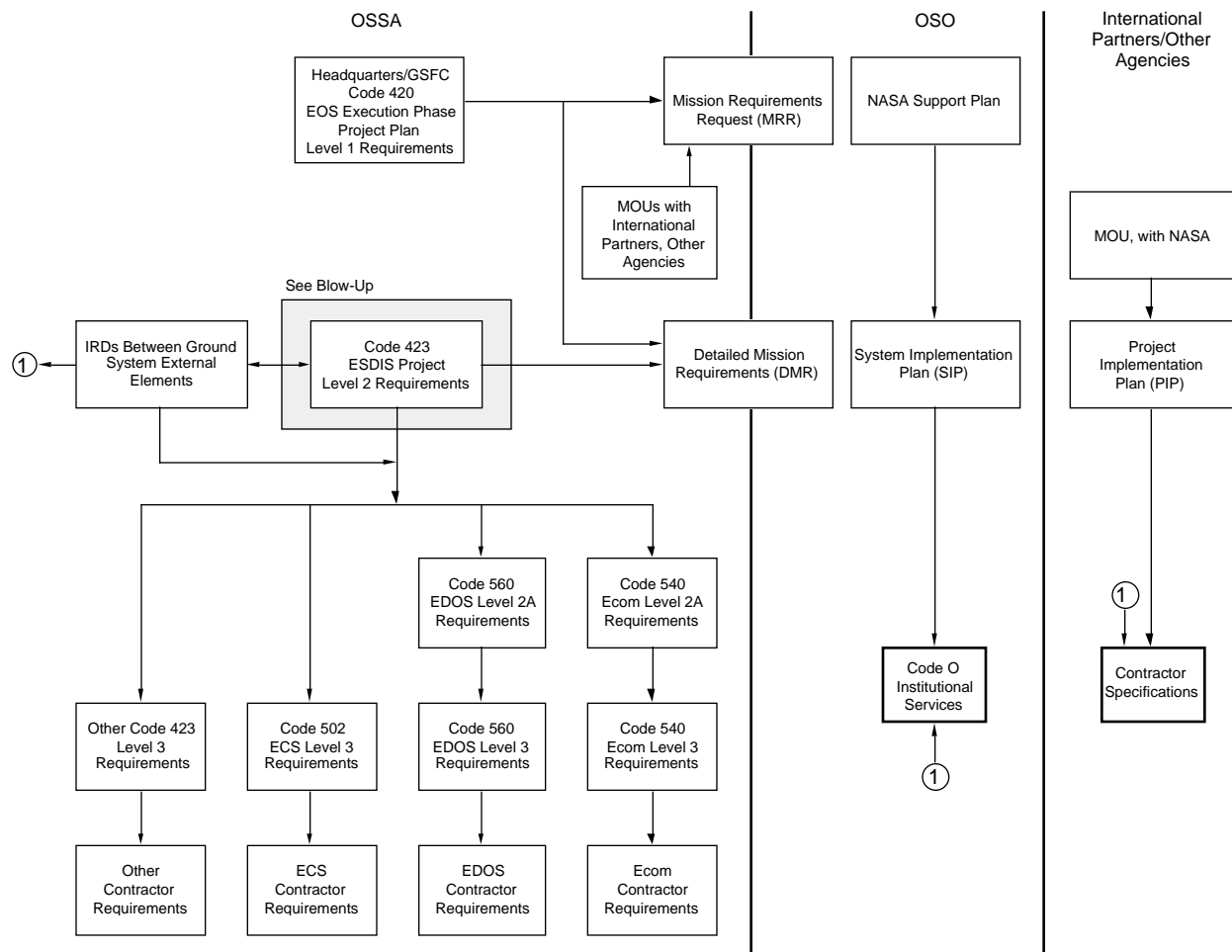
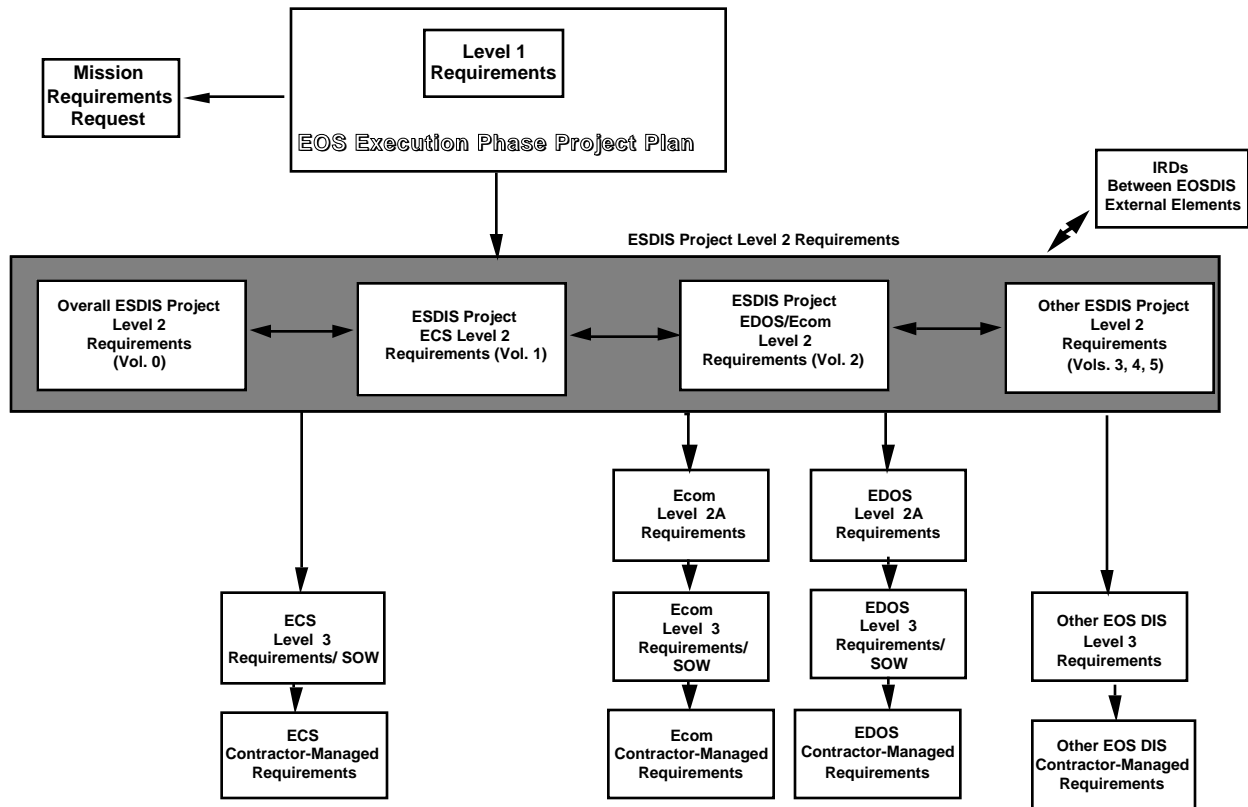**Figure 1-1. EOS Project Requirements Documents**

Figure 1-2. ESDIS Project Requirements Hierarchy

Section 2.   V0 System Level Requirements

This section presents the V0 requirements that are allocated at the system level. They are derived
from the documentation listed in Section 1.4. V0 requirements are the responsibility of the entire
system including both the ESDIS and the DAACs. Several requirements refer to "V0 approved"
guidelines, procedures, and standards. They are generated and accepted by both the ESDISP and
DAACs in a cooperative effort. The requirements are arranged in five sections: the first covering
overall system requirements, and the following sections covering specific system aspects: Science
Processing Library, Data Formats, Networking, and the Information Management System.

2.1 Overall V0 Requirements

SR-010   The V0 development effort shall utilize active prototyping, special studies, and the use
of standards to facilitate the evolution of EOSDIS.

SR-020   The V0 shall transition to V1 functionality utilizing a period of parallel operation while
users migrate from V0 to V1 with no loss of functionality, as defined by cooperative
DAAC, Project, and ECS plan development during the transition.

SR-030   The V0 shall not interrupt or degrade data and information service provided to users by
existing systems as these systems and their functions are incorporated into EOSDIS.

SR-040   The V0 development shall maximize the use of existing DAAC capabilities.

SR-050   The V0 shall consolidate the capabilities of existing DAAC data systems, building new
capabilities where needed.

SR-060   The V0 shall maintain service capabilities, that are currently located at DAACs (e.g.
NODS, PLDS, NCDS, SDCS), at agreed upon levels as of October 1991.

SR-070   The V0 shall develop data services that are most urgently needed, and build working
relationships between DAACs, ADCs, and the science research program that will be
critical when EOSDIS becomes fully operational.

SR-080   The V0 shall utilize V0 approved approaches for networking, data format, information
management, and archiving systems.

SR-110   The V0 shall develop and maintain a data dictionary and lexicon as a means of
standardizing the use of terms and definitions required for developing unambiguous
user queries for and access of data across DAACs.

SR-140   The V0 shall minimize the time between searching for data in the V0 domain and receiving the data.

SR-150   The V0 shall provide early PGS, DADS, networking, user support and IMS capabilities for EOS priority data sets within the EOSDIS system concept (Ref 5).

SR-160   The V0 shall continue the WetNet experiment as defined in its five year project plan.

SR-165   The V0 shall continue the ASF/SAR system upgrades to support JERS-1 and Radarsat.

SR-220   The V0 shall develop new software according to V0 approved portability guidelines (see Appendix B) and standards.

SR-230   The V0 shall perform testing and validation of the functions and performance of IMS, data formats, science processing library, network management and DAAC-unique tasks.

SR-240   The V0 shall maintain an adequate level of system security and data integrity as defined by:

    a.   open access to search of all levels of metadata,

    b.   no access to host operating system during search of metadata,

    c.   access to host operating system controlled by passwords,

    d.   access to restricted data controlled by passwords, and

    e.   media delivery of restricted data controlled by approved lists.

SR-250   The V0 shall support all Earth science research users for unrestricted data and approved Earth science researchers for restricted data.

2.2 SPL Requirements

SS-310   The V0 SPL shall support software contributions that assist science users in developing product generation software. This software includes utilities for science analysis and utilities that interface to a production environment.

SS-320   The V0 SPL shall provide the capability for the collection, storage and dissemination of contributed shareable software (not re-tested by SPL).

SS-330   The V0 SPL shall make software available to the users on-line.

SS-340   The V0 SPL shall collect and make available contributions of software provided by the DAACs and other sources.

SS-350   The V0 SPL shall index the software contributions and make available descriptions of the software.

SS-360   The V0 SPL shall provide "references" to other sources of shareable software.

SS-370   The V0 SPL shall provide equal service to users regardless of the user's point of contact with the DAAC.

2.3 Data Formats Requirements

SF-410   The V0 effort shall maximize the use of existing data formatting and packaging systems.

SF-420   The V0 effort shall utilize the Hierarchical Data Format (HDF) as the V0 prototype standard data format, where feasible, for:

    a. science users submitting data to an archive,

    b. distributing data to facilities routinely producing data products from archives, and

    c. distributing data products to science users in a form that is directly interpretable by analysis tools.

2.4 Networking Requirements

SN-510   The V0 networking effort shall work with the NASA Science Internet to support improving science user connectivity.

SN-520   The V0 networking effort shall work with the NASA Science Internet to ensure continued uninterrupted connectivity as currently available to the DAACs.

SN-530   The V0 networking effort shall provide network connectivity dedicated to supporting product generation, archiving, and information management services among the DAACs and selected ADCs.

SN-540   The V0 networking effort shall supplement existing site and institutional networking user support.

SN-550   The V0 networking effort shall support and supplement site fault detection and correction activities.

SN-560   The V0 networking effort shall characterize and quantify network traffic between DAACs for the activities related to the access of science data.

SN-570   The V0 networking effort shall monitor the networks and collect statistics to support analysis of end-to-end networking performance issues.

SN-580   The V0 networking effort shall work with the NASA Science Internet to provide analysis of user's networking interface needs, recommend strategies, and provide justification required for increases in V0 networking capacity.

SN-590   The V0 networking effort shall perform limited prototyping of potential data volumes, network paradigms, standards,and facilities for the purposes of supporting inter-DAAC science data access and documenting lessons learned.

2.5 ESDIS/IMS Requirements

SI-710   The V0 IMS shall develop a capability to achieve at least Level 2 interoperability with ADCs (i.e., provide integrated access to ADC systems providing search for ADC held data).

SI-720   The V0 IMS shall provide Level 3 interoperability between the DAACs (i.e., the capability to access on-line inventories at any of the DAACs without requiring the user to learn multiple inventory systems or be cognizant of the information's physical location).

SI-730   The V0 IMS shall utilize a common user interface that supports both alphanumeric and GUI-style user interfaces.

SI-740   The V0 shall utilize ESDIS IMS and DAAC recommended standards for metadata search.

SI-750   The V0 IMS shall populate, maintain and make available a directory that describes the data holdings of all of the DAACs and the data sets of interest to the EOS users at the ADCs.

SI-760   The V0 IMS shall provide cross-DAAC access to catalogs/guides that provide textual information, including detailed descriptions of the data.

SI-770   The V0 IMS shall provide a common procedure for submitting orders for data products held by the DAACs.

SI-780   The V0 IMS shall provide a data search capability to locate data sets of interest across DAAC inventory holdings by attributes including:

    a．spatial location/coverage,

    b．time, and

    c．identification of granule contents (e.g., radiance, sea surface temperature).

SI-790   The V0 IMS shall provide an experimental browse capability through the use of software tools for selected data sets for the purpose of improving the user's data selection and product ordering ability (i.e., simple display of a pre-defined browse product accessible over the network).

SI-800   The V0 IMS shall provide access to the capability for users to order software from SPL.

SI-810   The V0 IMS shall be able to exchange Directory Interchange Formats (DIFs) with the Global Change Master Directory (GCMD) and shall be functionally compatible with the GCMD.

SI-840   The V0 IMS shall provide the capability to collect statistics for long term monitoring of the distributed IMS performance.

SI-860   The V0 IMS shall support the evaluation of spatial search techniques and the development of spatial search standards.

SI-870   The V0 IMS shall utilize existing user interface standards in its development (e.g., Motif).

This page intentionally left blank.

Section 3. V0 DAAC Requirements

NOTE

> The baseline requirements for this section have been entered into the
> e-tracer system, and have had "RQIDS" assigned. For complete
> traceability, the full service and ideal requirements will need to be
> entered at some point. A cross-reference list between V0
> requirement numbers and RQIDs can be found in Appendix D.

This section presents the V0 requirements for the V0 DAACs. The requirements are arranged according to the three subsystems involved at each DAAC: IMS, DADS, and PGS. Each subsystem is organized in general categories. The DAAC requirements are presented in a tabular format where the columns represent the priority classes-Baseline, Full Service, and Ideal.

Baseline

> Requirements in the Baseline category are of highest priority and shall be implemented by mid-1994 by all DAACs.

Full Service

> Full Service requirements are those that some DAACs may implement given available resources.

Ideal

> Ideal requirements may be supported by only selected DAACs due to current availability or the specific nature of those DAACs.

Requirements that are unique to specific DAACs are covered in the Science Data Plan (Ref 5) and/or specific DAAC requirements documents.

Not all requirements within a category (i.e., Baseline, Full Service, Ideal) will be applied uniformly to each data set. For example, there may be no need to support browse for a data set that is of low interest to the scientific community (see Science Data Plan (Ref 5) for data priorities). It is desirable to have the highest priority data sets supported by the higher levels of service (given available funding) and lower priority data sets supported by lower levels of service. Appendix C provides guidelines for grouping the V0 requirements into "levels of service" that would be applied to an individual data set.

3.1 DAAC/IMS Requirements

IMS - Distributed Data Search and Data Order

Baseline DAAC	Full Service DAAC	Ideal DAAC
DI-100 The V0 DAACs support Level 3 interoperability with other DAACs in support of cross-DAAC searching as defined by ESDIS and DAACs (Ref 7). DI-105 The V0 DAACs shall support Level 3 interoperability with other DAACs in support of cross-DAAC order requesting, as defined by ESDIS and DAACs (Ref 7). DI-108 The V0 DAACs shall fill orders following current DAAC specific procedures. DI-110 The V0 DAACs shall populate the Global Change Master Directory (GCMD) with directory data via Directory Interchange Format (DIF) submissions. DI-120 The V0 DAACs shall support a common user interface for data search and data order and a common style for the user interface for DAAC unique functions, as jointly developed by ESDIS and DAACs (Ref 8). DI-125 The V0 DAACs shall support access to SPL via ESDIS IMS.		DI-500 The V0 DAACs shall support Level 3 interoperability with other DAACs in support of uniform, fully automated cross-DAAC order filling. DI-510 V0 DAACs shall notify previous requestors of a data product when that product has been reprocessed.

IMS - Distributed Data Search and Data Order (continued)

DI-128 The V0 DAACs shall maintain system security and data integrity while providing easy access to the systems for a broad user community.		
Baseline DAAC	*Full Service DAAC*	*Ideal DAAC*

IMS - Metadata Management

DI-130 The V0 DAACs shall maintain on-line inventory metadata. DI-150 The V0 DAACs shall inventory data by attributes including geo-reference, time, and identification of granule contents (e.g., radiance, sea surface temperature). DI-152 The V0 DAACs shall develop and maintain a DAAC-unique data dictionary.	DI-330 The V0 DAACs shall inventory data by attributes describing quality of the data (e.g., dropouts, level-of-review, processing anomalies, and algorithm developer/data producer defined quality values).	DI-520 The V0 DAACs shall inventory data based on granule contents (e.g., statistical information such as percent cloud cover, means, and variances).
DI-156 The V0 DAACs shall maintain on-line detailed textual information supporting use of data sets by science users (e.g., including such things as product types, availability etc.).	DI-340 The V0 DAACs shall generate and maintain detailed textual information (guide) as jointly defined by ESDIS and DAACs to support effective use of data products including: a) an up-to-date mission characteristics data base (e.g., orbital parameters, mission status, etc.) and b) an instrument characteristics data base (e.g., filters, gains, spectral bands, etc.)	
Baseline DAAC	*Full Service DAAC*	*Ideal DAAC*

IMS - DAAC Specific Data Search and Data Order

Baseline DAAC	Full Service DAAC	Ideal DAAC
DI-160 The V0 DAACs shall provide on-line search of metadata. DI-170 The V0 DAACs shall distribute metadata on-line and off-line. DI-180 The V0 DAACs shall provide data order capabilities, both on-line and off-line. DI-190 The V0 DAACs shall support on-line and off-line distribution of documentation, or documentation references, required to use data. DI-200 The V0 DAACs shall allow integrated on-line data search and data order. DI-220 The V0 DAACs shall support user search for all data holdings at a DAAC from a single system "sign-on" (i.e., user not required to learn multiple systems). DI-230 The V0 DAACs shall allow search of directory, granule level metadata, and guide information on a non-hierarchical basis. DI-235 The V0 DAACs shall support access to on-line pre-defined browse data products on an experimental basis via X-Windows interface. DI-240 The V0 DAACs shall generate data distribution statistics as per V0 approved guidelines.	DI-360 The V0 DAACs shall support user order request placement for all data holdings at a DAAC from a single system "sign-on" (i.e., user not required to learn multiple systems). DI-370 The V0 DAACs shall provide a basis for estimated cost prior to a user placing an order for data where a cost will be incurred.	DI-540 The V0 DAACs shall support both GUI and alphanumeric interfaces for current systems. CH01 DI-550 The V0 DAACs shall provide graphic geographic overlays to demonstrate inventory spatial coverage. DI-560 The V0 DAACs shall provide automatic periodic transmission of browse data products or user selected data to the scientist upon request. DI-565 The V0 DAACs shall support automated user order filling and accounting for all data holdings at a DAAC from a single system "sign-on" (i.e., user not required to learn multiple systems).

IMS - User Services

Baseline DAAC	Full Service DAAC	Ideal DAAC
DI-250 The V0 DAACs shall support all authorized Earth science research users as per V0 Data Policy (Ref 9). DI-270 The V0 DAACs shall support "data engineering" with projects and scientists submitting data (i.e., consult on DADS provided data submission procedures). DI-280 The V0 DAAC user support offices shall: a) provide help desk, b) assist users in using V0 systems, c) assist users to identify and locate data sets, d) coordinate with other centers to assist users, e) track data order accuracy and completion, f) compile user service statistics, g) provide system demonstrations, h) staff user support office with science and data knowledgeable personnel, i) update bulletin board with the latest news, j) provide 40 hour prime time staffing, k) provide support to field experiments, l) be knowledgeable of processing history and product revisions, m) provide up-to-date data validation information, n) develop and maintain a dictionary of DAAC-unique services, and o) collect and compile data quality comments from user /investigator.	DI-380 The V0 DAAC user support offices shall support scientists or projects writing of data product user's guides.	DI-570 The V0 DAAC user support offices shall: a) support writing of project data management plans (e.g., provide standards and guidelines for documentation) and b) provide extended hours staffing for international partners work hours overlap. c) distribute an inventory management system (i.e., software to support metadata ingest, maintenance, and search) to field campaigns in support of tracking data collection. DI-580 The V0 DAACs shall provide information regarding instrument applicability to science studies.
Baseline DAAC	*Full Service DAAC*	*Ideal DAAC*

3.2 DAAC/DADS Requirements

DADS - Data Interface

Baseline DAAC	Full Service DAAC	Ideal DAAC
DD-100 The V0 DAACs shall ingest L0-L4, algorithms, ancillary data, metadata from PGS (local or remote e.g., Earth Probes).		
DD-110 The V0 DAACs shall ingest from investigators; data, correlative data, metadata, etc. as per data submission procedures for the purposes of long-term archival.		
DD-120 The V0 DAACs shall ingest from other sources; data, correlative data, metadata, etc. as per data submission procedures.		
DD-130 The V0 DAACs shall archive ingested data to archival quality media and shall ensure that inventory and metadata information be captured and maintained in appropriate data bases.		
DD-140 The V0 DAACs shall distribute previously archived data, correlative data, data information, algorithm information, and documentation to science users within a month of the order request.	DD-410 The V0 DAACs shall distribute previously archived data, correlative data, data information, algorithm information, and documentation to science users within 2 weeks of the order request.	DD-600 The V0 DAACs shall distribute previously archived data, correlative data, data information, algorithm information, and documentation to science users within 3 days of the order request.
DD-150 The V0 DAACs shall receive data on magnetic tape (6250 bpi), CD-ROM, or via electronic transmission.	DD-420 The V0 DAACs shall receive data on V0 approved media.	

423-10-01-5

DADS - Data Interface (continued)

DD-160 The V0 DAACs shall distribute data in V0 approved formats (Ref 10). DD-170 The V0 DAACs shall distribute data on V0 approved media, i.e., 8mm tape, 4mm DAT, 6250 bpi tape, on-line (volume limited), and pre-published CD-ROMS (some, but not all data sets will be available on CD-ROM). DD-175 The V0 DAACs shall distribute data via electronic transmission, as is commensurate with data volume. DD-180 The V0 DAACs shall exchange with DAACs: L0-L4 data products, algorithms, ancillary data, metadata for the purposes of DAAC (local or remote) processing/archiving. DD-190 The V0 DAACs shall support the collection, assembly, and ensure the publication of data sets on CD-ROM for distribution to science users. DD-195 The V0 DAACs shall provide data submission procedures (e.g., formats, data dictionary, product documentation, browse, and metadata requirements) to projects and scientists submitting data products for archival storage and distribution.	DD-425 The V0 DAACs shall exchange with ADCs: L0-L4, algorithms, ancillary data, metadata for the purposes of DAAC processing and/or archiving. DD-430 The V0 DAACs shall exchange with the investigator computing facility: correlative data, calibration data, special products, metadata, algorithms, L0-L4 data, documents, ancillary data for the purposes of algorithm development and product quality assurance.	
Baseline DAAC	*Full Service DAAC*	*Ideal DAAC*

DADS - Data Management

Baseline DAAC	Full Service DAAC	Ideal DAAC
DD-200 The V0 DAACs shall store and manage data sets.	DD-440 The V0 DAACs shall load metadata to IMS automatically.	
DD-210 The V0 DAACs shall generate metadata in those cases where data source has failed to provide metadata as defined in data submission procedures.	DD-450 The V0 DAACs shall verify data quality (algorithm developer/data producer defined), format compliance, and completeness on ingest.	
DD-220 The V0 DAACs shall store appropriate information to be able to support reprocessing of data products produced at the DAAC PGS.		
DD-230 The V0 DAACs shall maintain algorithm developer/data producer supplied documentation on-line or off-line for users of data.		
DD-240 The V0 DAACs shall maintain algorithm developer/data producer supplied documentation on-line or off-line for users who do calibration and geometric correction.		
DD-250 The V0 DAACs shall make available on-line the high priority and most frequently requested data.	DD-455 The V0 DAACs shall make medium priority data available nearline (i.e., via automated media retrieval).	
DD-260 The V0 DAACs shall distribute granules of data.	DD-460 V0 DAACs shall support subsetting of granules based on spectral/major parameters, temporal boundaries, and simple spatial subsetting.	DD-610 The V0 DAACs shall support subsetting of granules based on general spatial parameters (e.g., polygonal boundaries).
DD-270 The V0 DAACs shall maintain and manage archives (i.e., insure data recoverability, follow NARA/NIST guidelines).		

DADS - Support for Search and Data Order

Baseline DAAC	Full Service DAAC	Ideal DAAC
DD-280 The V0 DAACs shall distribute data in response to IMS (local and remote) submitted requests. DD-290 The V0 DAACs shall make pre-generated browse data products available for display to support data search and data order on an experimental basis. DD-300 The V0 DAACs shall store browse data products on-line.	DD-490 The V0 DAACs shall distribute upon user request, along with data, an example set of "read" software that is portable and well documented. DD-510 The V0 DAACs shall incorporate an accounting system tracking orders and cost of purchasing data (Ref 9). DD-520 The V0 DAACs shall support distribution of data visualization products supplied to the DAAC by other sources (e.g., movie loop, special graphic representations).	DD-620 The V0 DAACs shall generate investigator defined browse data products when not provided by the source.

3.3 DAAC/PGS REQUIREMENTS

PGS - Processing of Data

DP-100 The V0 DAACs shall generate data products for high priority EOS precursor data sets as per Science Data Plan (Ref 5). DP-105 The V0 DAACs shall generate pre-defined browse data products.	DP-300 The V0 DAACs shall generate data products for medium priority EOS precursor data sets as per Science Data Plan (Ref 5). DP-310 The V0 DAACs shall support cooperative multi-DAAC product generation as per "V0 Science Data Plan".	DP-500 The V0 DAACs shall generate data products for low priority EOS precursor data sets as per Science Data Plan (Ref 5). DP-510 The V0 DAACs shall support automated scheduling of production.
Baseline DAAC	*Full Service DAAC*	*Ideal DAAC*

PGS - Data Interfaces

DP-110 The V0 DAACs shall use the DADS as PGS archival storage. DP-120 The V0 DAACs shall be capable of incorporating ancillary data sets (e.g., digital terrain databases, land/sea data bases, climatology databases, digital cartographic map databases) as required for product generation.		
Baseline DAAC	*Full Service DAAC*	*Ideal DAAC*

PGS   -   Science Interfaces

Baseline DAAC	Full Service DAAC	Ideal DAAC
DP-130 The V0 DAACs shall contribute to the SPL, existing general purpose public domain software utilities or references to such software required for product generation algorithm development. DP-135 The V0 DAACs shall provide file access subroutines, where appropriate, to the algorithm developer/data producer to enable generation of products in accordance with adopted data format standards. DP-140 The V0 DAAC shall provide investigator defined quality assessment information to allow the investigator to perform routine quality assurance on products. DP-150 The V0 DAACs shall help resolve quality assurance problems for PGS generated products (e.g., support debugging analysis, provide special test runs). DP-160 The V0 DAACs shall provide configuration control of algorithms. DP-165 The V0 DAACs shall support test and validation of new algorithm and calibration processes. DP-167 The V0 DAACs and scientists shall follow approved software sub-mission procedures when submitting algorithms to be run on the PGS.	DP-320 The V0 DAACs shall develop, and contribute to the SPL, general purpose tools for precursor instruments supporting product generation (e.g., given instrument position and attitude, determine Earth viewing). Tools must be requested by Science team. DP-340 The V0 DAACs shall provide software development support for porting of new algorithms.	DP-520 The V0 DAACs shall provide an integration and test environment for science algorithm development parallel to the PGS. DP-540 The V0 DAACs shall provide scheduling subroutines that interface to an automatic PGS scheduler. DP-550 The V0 DAACs shall provide existing software, or reference to software residing at the DAAC, to the SPL for routines commonly needed for data analysis and research.

PGS - Data Management Support

DP-170 The V0 DAACs shall associate, for all DAAC produced data products, available processing history, inventory metadata, format description, and ancillary data for use by researchers.	DP-370 The V0 DAACs shall generate algorithm developer/data producer defined data quality assessment metadata per product.	DP-570 The V0 DAACs shall generate, on an experimental basis, content based metadata for automatic loading of IMS inventories (e.g., statistical information such as percent cloud cover, means, and variances).
DP-180 The V0 DAACs shall generate processing histories for all DAAC produced data products.		DP-580 The V0 DAACs shall support data visualization product generation (e.g., movie loops, special graphic representations) where sources may be multiple DAACs, ADCs, or investigator computing facilities.
DP-190 The V0 DAACs shall generate metadata (i.e., geo-reference, time boundaries, etc., not content-based metadata) for automatic loading of IMS inventories.		
DP-200 The V0 DAACs shall package data in V0 approved formats according to "data submission" procedures provided by DADS.		
DP-210 The V0 DAAC PGS shall supply processing status to User Services to track product processing and provide status to the user when a DAAC supports processing of data products on user demand.		
Baseline DAAC	*Full Service DAAC*	*Ideal DAAC* _____

Appendix A. Acronyms

ADCs	Affiliated Data Centers
AOC	Architecture and Operations Concept
CD-ROM	Compact Disk - Read Only Memory
DAACs	Distributed Active Archive Centers
DADS	Data Archive and Distribution System
DIF	Directory Interchange Format
EBnet	EOSDIS Backbone Network
ECS	EOSDIS Core System
EDOS	EOS Data and Operations System
EOS	Earth Observing System
EOSDIS	EOS Data and Information System
ESDIS	Earth Science Data and Information Systems
ESDISP	Earth Science Data and Information Systems Project
ETS	EOS Test System
FTP	File Transfer Protocol
F&PR	Functional and Performance Requirements Specification
GCMD	Global Change Master Directory
GSFC	Goddard Space Flight Center
GUI	Graphic User Interface
HDF	Hierarchical Data Format
IMS	Information Management System
JERS-1	Japanese First Earth Resources Satellite
MRR	Mission Requirements Request
NARA	National Archive and Record Administration
NASA	National Aeronautics and Space Administration
NCDS	NASA Climate Data System

NIST	National Institute of Standards and Technologies
NODS	NASA Ocean Data System
PDMP	Project Data Management Plan
PGS	Product Generation System
PLDS	Pilot Land Data System
QA	Quality Assurance
RFC	Request for Comment
SAR	Synthetic Aperture Radar
SDCS	SAR Data Catalog System
SERT	System Engineering Review Team
SPL	Science Processing Library
TBD	To Be Determined
TCP/IP	Transmission Control Protocol/Internet Protocol
V0	EOSDIS Version 0
V1	EOSDIS Version 1

Appendix B. EOSDIS Version 0 Portability Guidelines

Software portability is the ability of source code to be easily moved from one hardware or software environment to another, to be recompiled in the new environment, and to execute correctly there with minimal changes.

Developing with portability as a primary goal may extend the initial software development period. However, if it is known, as with EOS, that the software will be ported to multiple platforms, developing with portability as a priority shortens the time period required for porting the software from system to system.

It is not practically possible to provide a definitive guide to portability. However, general recommendations can be given to maximize portability. The following paragraphs describe some guidelines which, if followed, will help to improve the portability of software for Version 0 of EOSDIS.

Languages

Operational system components should limit software development efforts to languages with documented standards. ANSI has produced specifications for C and FORTRAN. The Ada language is documented and defined by a MIL-Standard. Minimize the use of assembly language and extensions to the documented standards. Most compilers that are compliant to standards have directives that allow the compiler to flag any non-standard syntax or usage. Document the procedures for compilation and linking.

While the use of standardized programming languages is imperative for portability of operational system components, some aspects of V0 are fertile for experimentation with new programming paradigms (e.g., object oriented programming). When experimentation is deemed appropriate, more mature languages, supporting the new techniques, (e.g., C++, Smalltalk, etc.) should be used. These have developed "defacto" standards. If one of these languages is chosen, then every effort should be made to determine the status of the development of more formal standards, to obtain copies of draft standards proposals, and to conform to those draft standards. This approach ensures that new techniques can be used with minimum syntactic dislocations caused by major language alterations.

Interface Specifications

Develop software in compliance with the POSIX and X/Open Portability Guidelines, Issue 3 (XPG3) Standards. Limit system calls, syntax, commands, utilities, and usage to those defined by those specifications. Develop using compilers and system software which comply to these standards and avoiding extensions to the standards will improve portability to other compliant systems.

Document

Documentation is an important aspect of portability. The function, methods, and purpose of software units should be explicitly defined. Documenting software code both internally and externally provides insight to the purpose and expected functionality of the code and thus provides persons porting the code to a new environment direction when discrepancies occur. Hardware and environmental dependencies should be completely noted and described. Beyond source code documentation, compiler and linking directives and procedures should be documented.

Type Casting and Storage Classes

Declare and explicitly define the storage class of every variable, constant, function, and structure used. Assume no default declarations, definitions, or values. By assuring that all typecasting and storage classes are explicitly stated, the developer can minimize the likeliness of human misinterpretation or compiler differences affecting software results.

Register Variables and Wordsize

Avoid the use of register variables because they are always wordsize dependent. As wordsize changes from machine to machine, a register variable may change its size. This is also true for integer declared variables. The use of integer in C creates a variable of wordsize. Explicitly state the integer desired (i.e., short, long) which guarantees specific storage allocations.

Modularize

Divide the software into functional units. Separate and isolate any hardware or environmental dependencies into a limited set of modules. This makes analyzing and porting of the software a simpler and less time-consuming task.

Memory and Bit Manipulation

If possible, avoid bit manipulation routines. Use standard bit manipulation routines with caution, since different processors often have differing methods for aligning data items to word boundaries and may have varying machine and mass storage byte and word significance.

If possible, avoid memory manipulation routines. Use standard memory manipulation functions with caution. Many processors have requirements for memory page and bank edges, alignments, and sizes that have to be taken into account during a porting process. One of C's most common data types, the pointer, is a method for directly accessing memory locations. Be aware that there may be processor dependent idiosyncrasies in using pointers. Use standard library functions for obtaining memory and manipulating pointers.

Limit Conditional Compilation

Conditional compilations can allow developing code segments specific to processing environments. By developing code which is portable and adheres to standards rather than developing multiple sets of code for differing environments, the porting process will require less development of code with dependencies . Don't depend on conditional compilations to meet all portability needs.

Cross-Develop

If resources and time are available, develop code on several unique platforms concurrently. The testing of code segments, units, and functions on several platforms as the code is developed promotes portability. Documenting and removing differences in this process will maximize the likeliness that the code will be portable to other platforms.

Graphic User Interfaces

Currently there is no single standard for graphic user interfaces (GUIs). Motif and Open Look are two popular specifications that are based on the X Windows system developed by MIT. Future application program interface specifications for GUIs may be based on one or both these systems. It is recommended that software be developed using GUI specifications which have documented specifications such as Motif (documented by the Open Software Foundation) and Open Look (documented by AT&T).

Database Access

Limit software development efforts to relational database interfaces with documented standards. ANSI has produced specifications for SQL. X/Open has also produced a specification for SQL (X/Open Portability Guidelines, Issue 3 (XPG3), Volume 5, Data Management). Minimize the use of extensions to the documented standards.

Networking

The V0 system-level software (e.g., V0 system-level IMS and DAAC-to-DAAC communications) will utilize TCP/IP protocols for communication. Therefore, to ensure portability of code among the host platforms each host should comply with the TCP/IP protocol requirements documented in the following Requests for Comments (RFCs): RFC 1122, RFC 1123, and RFC 1340.

This page intentionally left blank.

Appendix C. Guidelines for Levels of Service for Archival and Distribution of Data Sets

The requirements listed in the previous sections of this document will not necessarily be applied uniformly to each data set held within a DAAC. Variation may occur due to the priority of the data set, to the nature of the data set, or due to limitations on funds.

The following guidelines outline "general" categories of support for data sets. These guidelines may be used for planning and costing data set specific support.

Service levels are ranked from the highest, 5, to the lowest, 1. These levels of service may be seen from two perspectives, the users and the DAAC staff. The user's perspective is summarized in the following paragraphs grouped according to categories of service. The DAAC staff's perspective is provided in the table that follows.

Level 1:   Lowest

This service level provides the bare minimum of support.

Knowledge of Staff

The user support staff is aware of the data set, and has a written log of what was accepted into the DAAC that they use to locate the data.

Data Quality

Data quality will be as provided by data producer.

Media readability will be checked upon copying for distribution.

Finding Data/Services

The data is described in the GCMD.

The user must speak to a user support staff member to find out about how the data may be distributed. The data set may only be distributable as a whole.

The user will receive the data in whatever format the data producer provided.

Documentation

The user support staff will distribute documentation they have received from the data producer.

The GCMD description is prepared based on documentation received.

Level 2:

This level of Service provides everything in Level 1 with the following additional support:

Knowledge of Staff

The user support office will be somewhat familiar with the data set and can give some limited guidance on its applicability. For example, the support office staff should know the resolution of data, and thus can advise a user on their suitability for particular studies.

Data Quality

The DAAC staff will attempt to assure that the contents of the tape match what they have been told is on the tape, and a check of media readability is made (e.g., format and time boundaries).

Finding Data/Services

The data set is described in the Global Change Master Directory, and a simple on-line form may be filled out to place an order for the data as a whole.

Any search for suitable subsets of the data is a manual process supported by the DAAC staff. However, an order that requires this sort of support may take some time.

Level 3:

This service level has the same checks of the data on input to the DAAC as Level 2, and can supply the same services, but additional on-line services are available.

Finding Data/Services

Data producer packaged "units" of data (i.e., granules) will be inventoried in an on-line system. The inventory of the data allows search on geo-referencing, time and identification of data contents, at a minimum. This allows the user to perform his own on-line search and order of the data.

The DAAC will distribute granules of data, but will not support subsetting below the "units" in which the data was packaged by the data producer.

The DAAC staff can assist with a search for the appropriate subsets of data, and in this case, given that there is an on-line inventory, this search will take less time and orders will be filled more quickly.

Level 4:

This level of Service provides everything in Level 3 with the following additional support:

Knowledge of Staff

The user support staff at the DAACs will be highly knowledgeable in the characteristics of the data, the history of the mission that produced the data, and any known concerns that other users of the data have expressed. Thus, in this case, a user may rely on the user support staff for fairly extensive help in understanding the data and getting explanations as to the data's suitability for his or her study.

Software Support

Sample software that reads standard format will be distributed on-line with data.

Finding Data/Services

The user will be able to examine on-line, a complete range of descriptions of the data (e.g., directory, guide, inventory and appropriate documentation).

Orders may be placed for subsets of granules, and for distribution in standard formats. This should reduce the time between receipt of the data and effective use of the data.

The data set may have been pre-packaged on a CD-ROM, and may be quickly available for distribution if the user is interested in a pre-packaged set of data.

Portions of the full data set may be held either on-line or near-line and made available for user access via networks.

There may be small representative samples of the data available for pick up over the networks.

Documentation

The data has been submitted to the DAAC from the data producer via procedures that assure complete documentation is available.

Data Quality

The representative samples of the data allow the user to experiment with the data prior to ordering, in order to make his own quality assessment.

Level 5: Highest

Level 5 is the highest level of data service and includes everything in Level 4 with the following additional support:

Software Support

Available companion data manipulation software may be distributed on-line.

Finding Data/Services

There are browse products available for every granule of data. These products may be viewed via X-terminal display or they may be picked up over the networks, and displayed by software resident in a user's workstation.

Data Quality

Data has been quality checked based on investigator defined procedures. Results are available with each data granule.

Levels of Service (1 of 2)

Data Set Support	(highest)	5	4	3	2	1	(lowest)
1. Logging data and documentation upon receipt of data		X	X	X	X	X	
2. Verification of media count		X	X	X	X	X	
3. Verification of data content		X	X	X	X		
4. Verification of media readability		X	X	X	X	X	
5. User services full and detailed support and assistance (e.g., advise regarding algorithm quality, history, known problems, etc.)		X	X				
6. User services support in advising on data applicability		X	X	X	X		
7. User services support for finding data		X	X	X	X	X	
8. Accessible via IMS search and order from other DAACs		X	X				
9. Directory DIF prepared and submitted to GCMD		X	X	X	X	X	
10. Inventory including: geo-reference, time, identification of data contents		X	X	X			
11. Generate or make available on-line detailed textual information on use of data set		X	X				
12. Data confirmed according to submission procedures		X	X				
13. Producer provided documentation made available		X	X	X	X	X	
14. Off-line search and order		X	X	X	X	X	
15. On-line search and order		X	X	X	X		
16. Pre-defined browse products available for every granule		X					
17. Pre-defined browse products available for "samples" of data		X	X				

Levels of Service (2 of 2)

Data Set Support	(highest) 5	4	3	2	1 (lowest)
18. Browse products available for remote X-terminal display	X				
19. Browse products available for FTP pick-up	X	X			
20. Browse products available on pre-developed media (CD-ROM)	X				
21. Distribution of data sets as a whole	X	X	X	X	X
22. Distribution of data granules	X	X	X		
23. Distribution of subsets of granules	X	X			
24. Distribution of data in a standard format	X	X			
25. Portions of the data set held on-line or available near-line converted to a standard format	X	X			
26. Distribution via networks if size permits	X	X			
27. Sample read software available (no guarantee fully portable)	X	X			
28. Standard read software available (portable to many platforms)	X				
29. Distribution of companion data manipulation software if available	X				
30. Frequent checks of DADS archive media readability	X	X			
31. Infrequent checks of DADS archive media readability	X	X	X		
32. Distribution of already archived data within a month of receiving request	X	X	X		
33. Data assembled, packaged, and published on CD-ROM	X	X			
34. Data quality assured on input to investigator defined QA procedures	X				

Appendix D. Cross-Reference List V0-Requirement Numbers To E-Tracer RQIDs

(TO BE SUPPLIED)

This page intentionally left blank.